CLAIMS

1. A method of growing an AlGaN semiconductor layer structure, the method comprising the step of:
(a) supplying ammonia, gallium and aluminium to a growth chamber thereby to grow a first (Al,Ga)N layer having a non-zero aluminium mole fraction by MBE over a substrate disposed in the growth chamber; wherein ammonia is supplied at a beam equivalent pressure of at least 1×10^{-4} mbar, gallium is supplied at a beam equivalent pressure of at least 1×10^{-8} mbar and aluminium is supplied at a beam equivalent pressure of at least 1×10^{-8} mbar.

2. A method as claimed in claim 1 wherein ammonia is supplied at a beam equivalent pressure in the range from 1×10^{-4} mbar to 2×10^{-2} mbar.

3. A method as claimed in claim 1 or 2 wherein the substrate temperature is within the range from 850°C to 1050°C.

4. A method as claimed in claim 1, 2 or 3 wherein gallium is supplied at a beam equivalent pressure in the range from 1×10^{-8} mbar to 1×10^{-4} mbar.

5. A method as claimed in claim 1, 2, 3 or 4 wherein aluminium is supplied at a beam equivalent pressure in the range from 1×10^{-8} mbar to 1×10^{-4} mbar.

6. A method as claimed in claim 5 wherein aluminium is supplied at a beam equivalent pressure in the range from 1×10^{-8} mbar to 2×10^{-7} mbar.

7. A method as claimed in any preceding claim and comprising the further step of:
(b) varying the supply rate of gallium and/or aluminium thereby to grow a second (Al,Ga)N layer by MBE over the first (Al,Ga)N layer, the second (Al,Ga)N layer having a different aluminium mole fraction from the first (Al,Ga)N layer.

8. A method as claimed in claim 7 wherein step (b) comprises reducing the supply rate of aluminium to zero whereby the second (Al,Ga)N layer is a GaN layer.

9. A method as claimed in any preceding claim and comprising the further step of:
(c) varying the supply rate of gallium and/or aluminium thereby to grow a third (Al,Ga)N layer by MBE over the second

(Al,Ga)N layer, the third (Al,Ga)N layer having a different aluminium mole fraction from the second (Al,Ga)N layer.

10. A method as claimed in claim 9 wherein the third (Al,Ga)N layer has substantially the same aluminium mole fraction as the first (Al,Ga)N layer.

11. A method as claimed in any preceding claim wherein the substrate comprises an (In,Ga)N layer.

12. A method as claimed in claim 11 wherein the substrate is an InGaN substrate.

13. A method as claimed in claim 11 wherein the substrate is a GaN substrate.

14. A method as claimed in claim 11 wherein the substrate comprises an (In,Ga)N epitaxial layer disposed over a base substrate.

15. A method as claimed in any preceding claim and comprising the further step of supplying a dopant during at least one of step (a), step (b) or step (c).

16. A method as claimed in any preceding claim wherein the first (Al,Ga)N layer has an aluminium mole fraction of greater than 0.01.

17. A method as claimed in any preceding claim wherein the first (Al,Ga)N layer has an aluminium mole fraction of less than 0.2.

18. An (Al,Ga)N layer grown by a method as defined in any of claim 1 to 17.

19. An (Al,Ga)N multilayer structure grown by a method as defined in any of claims 7 to 10.

20. An optoelectronic device comprising an (Al,Ga)N layer as defined in claim 18.

21. An optoelectronic device comprising an (Al,Ga)N multilayer structure as defined in claim 19.